Dietary soluble nonstarch polysaccharides in the weaner pig and interactions with postweaning colibacillosis

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Providing a postweaning diet that will encourage rapid weaner growth without causing the overgrowth of pathogenic strains of bacteria within the gastrointestinal tract is a challenge for pig producers. Postweaning diarrhoea, or colibacillosis, results from a proliferation of haemolytic *Escherichia coli* in the proximal small intestine. Dietary intake and composition have been found to influence the complex pathogenesis of this disease (1). This study reports the effects of feeding a source of soluble nonstarch polysaccharide (NSP) on (a) animal performance and aspects of gut development, and (b) haemolytic *E.coli* populations in the small intestine.

Two diets formulated to meet weaner requirements (2) were fed twice daily for seven days after weaning to four groups of pigs (six/group) weaned between 24-28 days of age. The base diet consisted of cooked white rice and an animal protein supplement (fishmeal, bloodmeal, meat and bone meal). The second diet differed only in that guar gum was included at 10% of the total composition by removing an equivalent amount of rice. For each diet two levels of intake were fed, ad libitum (high), and restricted intake at approximately 50% of ad libitum intake (low). An additional four groups of pigs (six/group) were fed the same diets but were orally challenged with 10^8 enterotoxigenic haemolytic *E.coli* (serovar 08; G7; K87; K88) for three consecutive days starting 48 hours postweaning.

	Rice[1] High	Rice[1] Low	Guar gum[1] High	Guar gum[1] Low	Significance Diet	Intake
pH of caecum	6.19 ± 0.13	6.00 ± 0.09	5.21 ± 0.05	5.23 ± 0.04	****	NS
pH of distal colon	6.47 ± 0.10	6.50 ± 0.13	5.64 ± 0.18	5.59 ± 0.10	****	NS
Small intestine, %EBW[2]	4.8 ± 0.4	4.6 ± 0.3	5.7 ± 0.2	4.9 ± 0.2	**	**
Small intestine content as %live weight	0.4 ± 0.2	0.4 ± 0.1	1.3 ± 0.3	0.8 ± 0.3	***	NS
Large intestine, %EBW	1.1 ± 0.06	1.2 ± 0.05	1.7 ± 0.1	1.5 ± 0.1	****	NS
EBW gain over 7 days(g)	828 ± 0.20	742 ± 0.25	217 ± 0.06	198 ± 0.19	***	NS
Colony-forming units *E.coli*/ gram small intestinal mucosal scraping	2.3×10^8		1.6×10^{10}		*	NS
E.coli presence in small intestine	25% positive		75% positive		**	NS

[1]mean±sem; [2]EBW, empty body weight; * P<0.1; ** P<0.05; *** P<0.01; ****P<.0.001; NS Not significant

Pigs fed the diet containing guar gum had more acidic contents in the caecum and colon (P<0.0001), had a heavier small (P<0.05) and large (P<0.0001) intestine, and gained less EBW (P<0.01) in the first seven days after weaning than their counterparts fed the diet based on cooked rice and animal protein.

The presence of haemolytic *E.coli* in the small intestine was affected by the type of diet fed. The pigs fed guar gum had more colony-forming units of haemolytic *E.coli* in the anterior small intestine (P=0.08) and more pigs were colonised (75% vs 25%) by the bacteria. Most observations were not affected by intake. Addition of guar gum increased hindgut fermentation and stimulated intestinal growth, but this was at the expense of EBW. The presence of guar gum also appeared to encourage colonisation of the small intestine by a pathogenic strain of *E.coli*. In summary, NSP had a profound effect on the gastrointestinal tract of newly-weaned pigs.

1. Hampson DJ. Postweaning *Escherichia coli* diarrhoea in pigs. In: Gyles CL, ed. *Escherichia coli* in domestic animals and humans. Wallingford, UK: CAB International, 1994:171-191.
2. National Research Council. Nutrient requirements of domestic animals, No.2, Nutrient requirements of swine, 9th rev. ed.Washington DC: National Academy Press, 1988.